INSPIRATION GOLD INCORPORATED

m/027/030

TOPAZ BERYLLIUM VENTURE
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July 7, 1992

F. Rex Rowley
Area Manager
House Range Resource Area
Bureau of Land Management
P.O. Box 778
Fillmore, Utah, 84631

RE: Topaz Beryllium Venture Plan of Operations and Environmental Assessment

Dear Mr. Rowley:

Enclosed please find one copy of the Plan of Operations and Draft Environmental Assessment for Topaz Beryllium Venture's (TBV) mining operation near Topaz Mountain. As you will recall from our meeting in August, 1990, TBV is planning to mine beryllium from three open pits on lands administered by the BLM near Brush Wellman's existing mining operations. The operation will disturb approximately 128 acres; 114.5 acres on public lands and 13.8 acres on patented claims. The ore from TBV's pits will be crushed on-site and then transported to a processing plant located on private property near Delta. As we discussed in our meeting, the PoO and EA are for the mining portion of the operation only.

If you have any questions regarding the proposed Plan of Operations or EA, feel free to contact us, or JBR Consultants Group in Salt Lake City.

Sincerely,

Robert A. Prescott by EWJ

Robert A. Prescott
Manager
Topaz Beryllium Venture

Enclosures

cc: E. Lips/JBR

BUREAU OF LAND MANAGEMENT
RECEIVED
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	INFO.	ACT.	AL
Warm Springs A.M.			
Rocky		✓	
House Range A.M.			JH
C.R.		/	
Operations Division			
FILE			

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OIL GAS & MINING

PLAN OF OPERATIONS
FOR THE
TOPAZ BERYLLIUM VENTURE

jbr CONSULTANTS GROUP

SALT LAKE CITY • RENO • CEDAR CITY

PLAN OF OPERATIONS
FOR THE
TOPAZ BERYLLIUM VENTURE

July 7, 1992

Prepared for:

Inspiration Gold, Inc.
P.O. Box 280
Delta, Utah 84624

Prepared by:

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1.0 General Overview

The proposed operation would include the mining of beryllium from three open pits, the development of five waste rock dump sites and three run-of-mine (ROM) ore stockpiles. Ore would be transported 35 miles to a leach pad recovery site for mineral processing. The general location of the facilities are shown on Figure 1. The option of crushing ore at the mine sites is also being considered, which would create three additional crushed ore stockpiles. The total disturbed area would be approximately 128 acres, of which 114.5 acres would be on public lands administered by the Richfield District of the BLM and 13.8 acres on patented claims (See Figure 2).

The Topaz Beryllium Venture (TBV) is a joint venture between Inspiration Gold, Incorporated, a Delaware corporation, and Beryllium International Corporation, of Utah. Inspiration Gold, Inc. owns a majority of the venture and is the operator of the beryllium project.

1.1 Location and Access

The Topaz Beryllium Venture is located near the Thomas Range, Juab County, northwest of the town of Delta, Millard County, Utah. The mining operations would be in Sections 26 and 35, T12S R12W SLBM and Sections 7, 8, 17, and 18, T13S R12W. The project is accessed by traveling northwest of Delta (off U.S. Highway 6), on the Brush Wellman Road for approximately 52 miles.

1.2 Surface and Mineral Ownership

The Bureau of Land Management is the primary surface and minerals owner of the proposed mine site. There are several patented and unpatented mining claims within the area to be disturbed, which have been acquired or leased by Topaz Beryllium Venture. Owners of the mining claims are listed in Table 1.2-1. Names and serial numbers of the claims are listed in Appendix A.

Table 1.2-1 **Mineral Ownership**

Owner	Type of Ownership
Glenn, Irene, and Florence Lowder 459 South 300 East Springville, Utah 84663	Unpatented Lode Claims
Gold-Spor Mining Company 1389 South 2000 West Delta, Utah 84624	Patented and Unpatented Lode Claims
Topaz Beryllium Venture P.O. Box 280 Delta, Utah 84624	Unpatented Lode Claims
Robert D. Nielson, et al. P.O. Box 214 Lynndel, Utah 84640	Unpatented Lode Claims
Floyd & Jene Bradfield, Stanley Bradfield, and Douglas J.& Dorthella G. Spencer 230 E. 7200 South Midvale, Utah 84047	Unpatented Lode Claims

Chapter 2 Proposed Plan of Operations

2.0 General Overview

The proposed operation would include the mining of beryllium from three open pits, the development of five waste rock dump sites and three run-of-mine (ROM) ore stockpiles. Ore would be transported 35 miles to a leach pad recovery site for mineral processing. The alternative of crushing the ore at the mine site is also being considered, which would create three additional crushed ore stockpiles. The total disturbed area at the mine site would be approximately 128 acres, of which 114.5 acres would be on public lands administered by the Richfield District of the BLM, and 13.8 acres would be on patented claims. The locations of the proposed mining facilities are shown on Figure 2. Details of the ultimate site development for each mining area are shown on Figures 3 through 5.

2.1 Mining

The beryllium mineralization at the Topaz Project is sporadic and has been identified in economic quantities in three pit areas to date. All pits would be mined using conventional open-pit mining methods. Minimum bench height would be 10 feet. Pit slopes would vary from approximately 40 to 60 degrees, and would be stable as determined by operating history of mines in the general vicinity. The outer perimeter of the mining areas would be posted with appropriate signs at access points to protect the public.

Haul roads are designed with a minimum width of 50 feet, a 10 percent maximum gradient, and a minimum inside turning radius of 50 feet. These, and other dirt roads would be treated with water at a rate sufficient to control dust during mining operations. Water would be obtained from private sources near Delta and trucked to the mining sites.

The waste material would be drilled and blasted with explosives and marked to distinguish it from ore. The ore grade material would be drilled for grade control purpose, ripped by a dozer, and pushed into an ore pile for loading. The ore and waste material would be loaded into haul trucks and hauled to designated areas. Waste would be hauled to a waste dump location near the open pit. Ore would be hauled to a ROM ore stockpile.

The total amount of ore that would be removed from the three pits would be approximately 255,000 tons. The approximate amount of waste material removed from the three pits and disposed of in the mine dumps would be 7,984,000 tons. The total amount of rock moved during the operations would be approximately 8,239,000 tons. Table 2.1-1 shows the minable ore reserves and waste rock estimated in each pit. The mining of the three pits would take place over a 9 year period. The Hogsback deposit would be mined during year one, the Claybank and part of the Horn deposit during year three, and the remaining Horn deposit during years five, seven, and nine. No mining activity would take place during years two, four, six, and eight.

Table 2.1-1 Minable Ore Reserves by Pit

Pit	ROM Ore	Waste Rock
Horn	185	7,457
Hogsback	55	423
Claybank	15	104
Total	255	7,984

Note: All figures are in 1,000s of tons.

Mining would be conducted by a mining contractor working up to twenty-four hours per day, 365 days per year. The mining rate would vary depending upon which pit is being mined. Proposed mining and crushing equipment is listed in Table 2.1-2.

Ammonium nitrate with fuel oil (ANFO) would be the primary explosive used at the site. Blasting caps with cast boosters would be used to initiate the blasts. Explosives storage and handling would conform to Mine Safety and Health Administration (MSHA) and Department of Transportation (DOT) regulations. Explosives would be stored according to their classification, with Class A explosives stored separately from Class B explosives. Locks to magazines shall be hooded and the magazines grounded. The magazines would be kept beyond the recommended distance for the volume of explosives stored. The blasting part of the operations would be handled by the mining contractor.

Table 2.1-2 Proposed Mining and Crushing Equipment

Pit	Operation	Equipment
Horn	Mining	1 - 6.5 yd^3 wheel loader 3 - 50 ton trucks 1 - rotary blasthole drill rig 1 - track dozer 1 - model 12G motor grader 1 - water truck *
Hogsback	Mining	1 - 5.0 yd^3 wheel loader 3 - 35 ton trucks 1 - rotary blasthole drill rig 1 - track dozer 1 - model 12G motor grader 1 - water truck *
Claybank	Mining	1 - 4 yd^3 wheel loader 3 - 20 ton trucks 1 - rotary blasthole drill rig 1 - track dozer 1 - model 12G motor grader 1 - water truck *
Horn Hogsback Claybank	Crushing	1 - jaw crusher 1 - vibrating screen deck 1 - cone crusher 1 - 6.5 yd^3 loader

* various support equipment (light plants, pickups, fuel/lubricating truck, tire truck, etc.)

2.2 Crushing

Coarse ore (with a maximum size of 16 inches) from the mine would be hauled by trucks and stockpiled for crushing. The ore would be moved by a front-end loader from this coarse ore stockpile to the coarse ore bin. A hopper and a stationary grizzly with a 12-inch opening would be located on top of the bin.

Ore from the bin would be discharged to the jaw crusher by a vibrating grizzly feeder. The ore would be crushed in the jaw crusher to less than 2 inches at a maximum rate of 200 tons per hour. Crushed ore from the jaw crusher would be conveyed to a standard cone crusher, operating in closed circuit with a vibrating screen. This would produce a product less than 5/8-inch in size. The crushing process would take place a maximum of 2,000 hours per year. Crushed ore would be hauled by truck to the plant site.

2.3 Ancillary Facilities

Ancillary facilities would be used by both Inspiration Gold Inc. and mining contractor personnel. The facilities would consist of a mine site office trailer, an explosives magazine, a tire and lubricating oil storage structure, a fuel storage tank, and other mining operations support facilities.

2.4 Waste Disposal

Waste rock material that is removed from the three open pits would be dumped in designated waste dump sites. After the completion of the mining process these dumps would be reclaimed. A total of approximately 7,984,000 tons of waste rock would be placed in five waste dumps. These dumps would occupy an area of approximately 68 acres.

Waste oil and solvents would be placed in a specially designated above-ground storage tank. When and adequate volume has been accumulated, it would be collected by a recycling contractor.

Paper refuse such as office paper wastes, packaging materials, etc., would be collected and disposed of into a dumpster or trash can. These containers would be collected for disposal in a off-site landfill when they reach capacity.

Sanitary disposal would consist of a holding tank at the on-site office trailer or porta-johns if found to be more convenient. These units would be serviced by a local contractor when required.

2.5 Topsoil Management

Areas from which salvageable topsoil is available were determined by overlaying the soils map on the site project facilities map. In cases where there was not enough salvageable topsoil to meet the reclamation objectives, an additional volume of material would be obtained from borrow pits. The results of this determination indicates that a total of 105,600 cubic yards of topsoil material is available at the mine sites. These totals are summarized in Table 2.5-1.

Table 2.5-1 **Topsoil Salvage**

Area	Salvage Depth	Acreage (acres)	Volume (yards)	Soil Type
Horn Project:				
Pit and Adjacent Area	12 inches	16.1	26,000	* FSF Alluvial
North Waste Dump	12 inches	16.8	27,100	FSF Alluvial
South Waste Dump	12 inches	10.2	16,500	FSF Alluvial
Haul Roads	12 inches	2.2	3,500	FSF Alluvial
		45.3	73,100	
Hogsback Project:				
Ore Stockpile	12 inches	2.1	3,400	Sandy Loam
Ore Stockpile	12 inches	2.1	3,400	Alluvial
North Waste Dump	12 inches	8.6	13,900	Sandy Loam
Borrow Pit	12 inches	1.3	2,100	Sandy Loam
Haul Roads	12 inches	0.5	800	Sandy Loam
		14.6	23,600	
Claybank Project:				
Waste Dump	10 inches	1.0	1,600	Cobbly Loam
Ore Stockpile	12 inches	4.0	6,500	Sandy Loam
Haul Roads	12 inches	0.5	800	Sandy Loam
		5.5	8,900	
	Totals:	**65.4**	**105,600**	

* FSF - Fish Springs Flat

The topsoil from each project area would be removed by a bulldozer prior to the beginning of the mining operation. The topsoil would be stockpiled in a designated area located near the disturbance. The stockpiles would be contoured and seeded to stabilize them and to prevent erosion loss. After completion of the mining activity, the topsoil would be used in the reclamation process. Topsoil would be spread over the waste dumps and then seeded with a prescriptive seed mix.

2.6 Runoff and Sediment Control

The runoff control plans for the three mine areas have been designed to direct runoff from undisturbed sites around the disturbed areas and to transport runoff from the disturbed areas through the sites in a manner which provides sediment control. The plans are shown on Figures 3 through 5. They consist of: small, triangular ditches; larger trapezoidal ditches; cmp culverts; berms, and silt fences which would redirect and treat storm runoff as it passes through the mine sites.

The Hogsback would be in the valley bottom south of Eagle Rock Ridge and west of the Thomas Range. Two large unnamed watersheds contribute ephemeral runoff to channels that drain southwestward out of the Thomas Range and through the mine site. The Claybank area would be located along the eastern slopes and flank of Eagle Rock Ridge; runoff from the proposed disturbed areas would be directed south along the alluvial valley bottom. A small divide is located near the north end of the Claybank area and upstream, undisturbed area runoff would be conveyed north to that watershed. The Horn area would be located on the west alluvial flank of Spor Mountain downstream of the Brush Wellman open pit mines; much of the runoff from the upstream area is intercepted by these pits. The remainder would be directed westward away from proposed disturbed areas.

Temporary runoff structures have been designed to safely transport the peak flow from the 10-year, 24-hour storm, and permanent structures have been designed for the 100-year, 24-hour storm. Precipitation depths for these storms are 1.7 and 2.6 inches, respectively, as obtained from the Hydrologic Atlas for Utah (Miller et al., 1973); an SCS Type II storm distribution was used to derive the hydrographs.

Runoff volumes and peak flows were calculated using the SCS Curve Number/Unit Hydrograph method (SCS, 1972). A computer program (Hawkins and Marshall, 1980) was used to generate the hydrographs. Where flow from two separate areas would contribute to one ditch or culvert, calculated peaks from each area were simply added to estimate a design peak for the ditch; this was done to provide a measure of conservatism to the designs. Figures 3 through 5 show the boundaries of the drainage basins, and Table 2.6-1 provides some of the drainage basin characteristics and results of the analyses.

Table 2.6-1 Drainage Basin Characteristics

Drainage ID	Area (ac)	CN	Design Event	Peak from Design Event (cfs)
Hogsback Area				
A	8.2	89	10yr-24hr	6.8
B	3.6	89	10yr-24hr	3.0
C	8.2	89	10yr-24hr	6.9
D	3.4	78	10yr-24hr	1.2
E	14.6	76	10yr-24hr	4.0
F	415	75	100yr-24hr	225
G	436	75	10yr-24hr	60
Claybank Area				
H	16	75	10yr-24hr	4.0
I	5.0	89	10yr-24hr	4.2
J	3.4	89	10yr-24hr	2.9
Horn Area				
K	6660	75	100yr-24hr	1030
L	319	75	100yr-24hr	140
M	8.1	75	10yr-24hr	1.2
N	26	75	10yr-24hr	5.2
O	40	85	10yr-24hr	24
P		Internal Drainage		
Q	30	86	10yr-24hr	20
R	16	89	10yr-24hr	13
S	15	89	10yr-24hr	12
T	6.5	89	10yr-24hr	5.3
U	25	86	10yr-24hr	16

Proposed ditches would be constructed either with a triangular or trapezoidal cross section. Culverts would be round, corrugated metal pipe and would be removed upon reclamation. Silt fences would be constructed with geotextile fabric and field fence backing.

The Hogsback area would consist mainly of the north and south waste dumps and associated ore stockpiles. The dumps would encroach upon an ephemeral channel which drains a large watershed (area F) to the east; a permanent diversion channel would be constructed to direct the watershed runoff east of the dumps. Another large watershed (area G) is drained by a channel that flows south between the proposed ore stockpile areas. Runoff in this channel would be conveyed under the proposed road via cmp culverts. Several other small ditches and one additional culvert would convey small amounts of runoff from disturbed areas (areas A-E) to silt fences and off the site. Table 2.6-2 provides information on these ditches and other proposed ditches for the remaining project areas. Table 2.6-3 provides information on culverts for the project.

Table 2.6-2 Ditch Information

Ditch ID	Design Flow (cfs)	Bottom Width (feet)	Side Slope h:1v	Normal Depth (feet)	Normal Velocity (fps)
Hogsback Area					
1	6.8	4	2.5	0.3	5.4
2	3.0	0	2.0	0.6	4.7
3	9.8	8	2.5	0.2	5.3
4	6.9	4	2.5	0.3	5.2
5	1.2	2	2.5	0.1	4.9
6	4.0	2	2.5	0.3	5.2
7	225	10	3.0	1.5	10.1
Claybank Area					
8	4.0	0	2.0	0.6	5.1
9	4.2	4	2.5	0.2	5.1
10	6.7	2	2.5	0.2	5.1
Horn Area					
11	1170	8	3.0	3.0	*
12	139	8	3.0	1.7	6.1
13	1.2	0	2.0	0.5	2.6
14	5.2	0	2.0	0.7	5.2
15	16	4	2.5	0.5	5.8
16	24	8	2.5	0.4	6.1
17	52	4	2.5	1.2	5.7
18	13	0	2.0	1.1	5.8
19	12	0	2.0	1.1	4.8
20	5.3	0	2.0	0.7	5.5
21	52	4	2.5	1.1	7.2

* See explanation in text

The Claybank area would have an open pit and associated waste dump located near the south end of the area, and ore stockpiles located near the north end. Runoff from these small disturbed areas (I and J) would be conveyed south via small ditches through silt fences. Upstream undisturbed area (H) runoff would be directed northward via a ditch to prevent flow on to the disturbed areas.

Table 2.6-3 Culvert Information

Culvert ID	Design Flow (cfs)	Pipe Diameter (inches)	Headwater during Design Peak (feet)
Hogsback Area			
1	60	60	10
2	6.9	18	1.8
Horn Area			
B	12	18	2.2
C	52	36	4.5
D	13	24	2.0

Much of the runoff upstream of the Horn area is contained in open pits owned by Brush Wellman. Two large watersheds (K and L) drain through the property along its south side; they would be permanently diverted away from the disturbed area. Peak flows for these areas were calculated as described above. However, actual flow in these watercourses is probably significantly dissipated due to infiltration once they reach the alluvial valley fill. This is confirmed by field observations of the size of the water courses. Therefore, channels were not designed to pass the calculated flows. Instead, the existing, natural channel in these reaches would be used as a guide and equivalent conveyance capacity would be constructed in the diversion reach. Runoff from a smaller undisturbed area (N) would be diverted away from disturbed areas near the north end of the property. Drainage area P represents the pit area and runoff would primarily drain to the pit. Drainage areas M, O, and Q through T are predominantly disturbed areas associated with the dumps and other facilities appurtenant to the mine. Runoff from these areas would be directed through the site via ditches and culverts before being treated with silt fences.

All runoff and sediment control structures, including ditches, culverts, berms, and silt fences would be inspected on a quarterly basis and after significant runoff events. Any necessary repairs or maintenance items would be accomplished as soon as feasible after the inspections. Items that would be examined would include stability of structure, ability to function as designed, material quality, etc. Any non-functioning structures whose failure could result in emergency situations would be repaired immediately and their status reported to Topaz's chief engineer. Inspection and maintenance records would be kept on written forms and filed in office for future reference.

Chapter 3 Reclamation Plan

3.0 General Overview

Approximately 128 acres would be disturbed at the three mine site locations during the life of the operation. Of this acreage, all but approximately 20 acres of the pits would be reclaimed. Table 3.0-1 lists the sites to be disturbed and those to be reclaimed. Reclamation would involve regrading the "cut and fill" construction type haul roads to approximate the pre-mining topography. Roads bottoms and other compacted surfaces would be ripped to relieve compaction. Topsoil would be spread and then the areas would be revegetated.

Reclamation would take place on dumps and pit areas as they are phased out of the mining operations. Post reclamation contours for the mine sites are shown on Figures 6 through 8.

3.1 Land Use

The objectives of the reclamation plan include minimizing or eliminating public safety hazards, stabilization of disturbed areas, and provisions for post-mining surface conditions that would be consistent with the long-term land use. The primary long-term land uses are expected to be for wildlife habitat and livestock grazing. Reclamation and revegetation would provide livestock forage and wildlife habitat in an improved condition, would maintain the present water quality, and would restore the scenic quality in the long-term, with the exception of the open pits.

3.2 Demolition and Disposal

Upon closure, the ancillary facilities, including buildings and equipment, would be dismantled and removed from the property. Buildings and equipment with salvage value would be sold or transported to another project. All remaining scrap and demolition debris would either be disposed of off-site.

Foundations, walls, and sumps would be pushed flat and/or covered with earth to eliminate any safety hazards for wildlife, livestock or humans. Where conditions allow, walls and foundations would be pushed down or broken-up during demolition and covered with earth. Sumps or other voids would be backfilled with sufficient surcharge so that exposure would not occur after settling.

Table 3.0-1 Disturbance and Reclaimed Areas

Site Description	Area Disturbed (Acres)	Area Reclaimed (Acres)	
Horn Project:			
Haul Roads	2.2	2.2	
Pit and Adjacent Area	24.1	7.6	
Ore Stockpiles	5.7	5.7	
North Waste Dump	33.5	33.5	(15.0)
South Waste Dump	20.3	20.3	(15.1)
Topsoil Stockpiles	4.9	4.9	
Offices, shops, & parking	6.1	6.1	
	96.8	80.1	
Hogsback Project:			
Haul Roads	0.5*	0.5	
Pit Area	4.8*	2.4	
Ore Stockpile	2.1	2.1	
Ore Stockpile	2.1*	2.1	
North Waste Dump	6.0	6.0	(3.7)
North Waste Dump	2.6*	2.6	
South Waste Dump	3.4*	3.4	(1.0)
Borrow Area	1.3	1.3	
Topsoil Stockpiles	0.7	0.7	
Topsoil Stockpile	0.4*	0.4	
	23.9	21.5	
Claybank Project:			
Haul Roads	0.5	0.5	
Pit Area	0.7	0.0	
Ore Stockpiles	4.0	4.0	
Waste Dump	2.1	2.1	(1.2)
Topsoil Stockpile	0.3	0.3	
	7.6	6.9	
Total:	128.3	108.5	(36.0)

* Private Ground

( ) The steep dump slopes (36 acres total) will not achieve bond release or provide wildlife habitat in three years (See Sections 4.6 and 4.8).

3.3 Earthwork

Regrading of the disturbed areas would be done at the on-site ore crushing areas and the haul roads. No regrading would be done in the open pits or waste dump sites.

Open Pits

The proposed open pits would be left in their final mining configurations. The pits would not be reclaimed, except for the part of the Hogsback Pit bottom that daylights into the top surface of the south waste dump. The topsoil salvaged from the open pit areas during mining would be used elsewhere on the project site during reclamation. The pit walls would be left with overall pit slopes of between 40 and 60 degrees consisting of benches on designed levels. Slope stability of pits in the same general area, have established that these slopes would be stable for the life of the operation, and for some time afterward. Long term stability cannot be determined until mining is well underway and all of the pit walls have been exposed. Large scale mass failures of the pit walls are not expected to be common following mining but rather it is expected that the walls between the benches would gradually ravel and deposit rocks on the benches. These rock falls would be infrequent and are expected to be easily avoidable by animals or persons from within the pits. This action over time would gradually produce talus slopes at about the angle of repose which would then become stable. Cutting back the pit walls to provide added safety factors would be uneconomical, create additional surface disturbance, and require additional surface drainage considerations.

Safety berms would be constructed adjacent to highwalls remaining after mining. These berms would provide for public safety for many years following mining.

There would be no surface discharge from the pits and the relatively small amount of runoff from the surrounding land surfaces and the precipitation directly into the pits would evaporate.

Crushing and Ancillary Facilities

Road fills and drainage crossings would be regraded to a natural shape and gradient, and culverts would be removed. Drainage crossing and grades that are part of roads having a valid post-mining use would not be regraded.

Dikes and ditches that are no longer required for control of surface drainage would be regraded during reclamation to blend with the surrounding terrain. Sediment control would be practiced until the revegetation efforts have been determined successful.

Compacted surface roads, stockpile areas, parking areas, and building areas would be ripped prior to topsoiling. The ripping procedure relieves compaction, inhibits soil loss from run-off, and provides a proper seedbed for seeding.

Waste Rock Dumps

The waste rock dumps would be constructed by dumping along the length of the dump in one increment or lift. The final overall dump slopes would be at the angle of repose, approximately 1.5h:1v, and extending in one slope from the top to the bottom of each dump. During reclamation, the slopes of each dump would remain at their natural angle of repose. Topsoil would be placed on the top surfaces of the waste dumps.

The last material placed on the dump top surfaces would be purposely left in the form of irregular ridges, hills, and valleys to break up the final top surface topography. This irregular topography would provide enhanced topographic cover for wildlife. Topsoil would be spread over these irregular surfaces to the appropriate depths described in Section 3.5.

Haul Roads

The haul roads of the mining operation, not located within the open pits, and not necessary for future mining access would be reclaimed by regrading to approximate natural contours. The compacted roadbed would be ripped to a depth of two feet by dozer rippers.

All drainages along the haulage routes would be opened up during regrading and the culverts removed. The resulting channels would be of the same capacity as adjacent natural reaches.

3.4 Drainage and Sediment Control

After completion of operations, most of the runoff and sediment control structures would be removed during the course of reclamation activities. As roads are eliminated, roadside ditches and culverts would be removed. Other ditches associated with directing disturbed-area runoff would also be eliminated by regrading because they would no longer be needed. The only ditches or diversions that would remain after reclamation is complete would be # 7 in the Hogsback area, and # 11 and # 12 in the Horn area. These three ditches have been designed to pass the peak from the 100-year, 24-hour rainfall event. They would continue to serve to divert upstream, undisturbed-area runoff away from the mine areas. Within the downstream portion of watershed E in the Hogsback area, some channel reconstruction would be done to reestablish the small ephemeral channel that would be covered during operations by the crushed ore and topsoil stockpiles.

Upon removal of the road and culvert in watershed G, the original channel elevation, grade and cross sectional area in the location of the culvert would be reestablished. The other culverts serve during operations to direct ditch flow across the road; these areas would not represent flow paths after regrading has occurred and no channel construction or reconstruction would be necessary.

Silt fences installed during operations would also be removed, as would berms surrounding ore and topsoil stockpiles. Additional silt fences, if required during reclamation, would be installed on a temporary basis.

After reclamation is complete, some runoff contributed from small, upstream areas would enter pits. This water would be expected to evaporate within short time periods; prolonged standing water would not be expected.

3.5 Topsoil Plan

Prior to mining, topsoil would be stripped from the proposed area of disturbance and stockpiled for use during the reclamation process as discussed in Section 2.5. The topsoil stockpiles would be contoured and seeded with grasses and legumes in the first full season following their construction to stabilize them and to prevent erosion loss.

The topsoil plan would take into account the actual salvageable topsoil materials available, the revegetation requirements for critical sites, and the use of substitute soil materials to provide adequate rooting depth and water holding capacity.

Proposed topsoil placement for each site is shown in Table 3.5-1.

The present soil survey indicates that about 105,600 and cubic yards of topsoil would be available. This indicates there would be an excess of approximately 600 cubic yards after topsoil placement. The additional topsoil material remaining in the stockpiles would be distributed in the areas where additional depths of topsoil may be required. Where terrain allows, topsoil would be placed by belly dump scrapers.

3.6 Seedbed Preparation

All compacted surfaces would be ripped to an approximate depth of 18 inches with rippers spaced approximately 24 inches apart prior to topsoiling. After placement, the topsoil would be scarified to a depth of approximately 6 inches to relieve compaction.

3.7 Fertilization

Fertilization would consist of a superphosphate (0-48-0) dry pellet fertilizer applied at a rate of 200 lbs/acre and sulfur-coated urea (39-0-0, 10 percent S) applied at 128 lbs/acre. In addition, because the soils are high in sodium at the Horn, gypsum ($CaSO_4 \cdot 2H_2O$, 20 percent Ca) would be applied at a rate of 350 lbs/acre to provide a source of Ca^{++} which would tend to replace the Na^{++} in the alluvial soils.

Table 3.5-1 Topsoil Placement

Area	Placement Depth	Acreage (acres)	Volume (Yards)
Horn Project:			
Areas Adjacent to Pit	12 inches	7.6	12,300
Ore Stockpiles	12 inches	5.7	9,200
Haul Roads	12 inches	2.2	3,500
North Waste Dump	12 inches	18.5	29,800
South Waste Dump	12 inches	5.2	8,400
Offices, shops, & parking	12 inches	6.1	9,800
		Total 45.3	73,000
Hogsback Project:			
Ore Stockpiles	12 inches	4.2	6,700
Haul Roads	12 inches	0.5	800
North Waste Dump	12 inches	4.9	7,900
South Waste Dump	12 inches	2.4	3,900
Pit Bottom	12 inches	2.4	3,900
		Total 14.4	23,200
Claybank Project:			
Ore Stockpiles	12 inches	4.0	6,500
Haul Roads	12 inches	0.5	800
Waste Dump	12 inches	0.9	1,500
		Total 5.4	8,800
	Project Total	**65.1**	**105,000**

3.8 Mulching

Green alfalfa hay would be spread onto the topsoiled reclamation surfaces at the rate of 2 tons per acre using a mulch blower. The seed drill would cover the mulch with topsoil and anchor it in the root zone.

3.9 Seeding and Planting

After topsoiling, the disturbed acreage would be seeded with the seed mix listed in Tables 3.9-1 and 3.9-2 for the Horn and Dell sites respectively. Seeding would take place in the fall after October first.

A seed drill set at ¼- to ½-inch planting depth would be used to seed all reclamation components that have gradual slopes or flat surfaces. Slopes that exceed 2.5h:1v would be seeded by hand broadcasting. The fertilizer, mulch, and seed would be covered by raking or backdragging with chains.

Table 3.9-1 Reclamation Seed Mix for the Horn

Species		Seeds/lb	PLS lbs/ac
Grasses			
Galleta	Hilaria jamesii	159,000	3.0
Indian ricegrass	Oryzopsis hymenoides	141,000	3.0
squirreltail grass	Sitanion hystrix	192,000	2.0
sand dropseed	Sporobolus cryptandrus	5,298,000	0.1
			8.1
Legume			
yellow sweetclover	Melilotus officinalis	260,000	1.0
Forbs			
Palmer's penstemon	Penstemon palmeri	610,000	0.5
globemallow	Sphaeralcea ambigua	500,000	0.5
			1.0
Shrubs			
four-wing saltbush	Atriplex canescens	52,000	4.0
shadscale	Atriplex confertifolia	64,900	4.0
winterfat	Ceratoides lanata	56,700	4.0
green rabbitbrush	Chrysothamnus viscidiflorus	782,000	0.2
			12.2
		Total	22.3

Table 3.9-2 Reclamation Seed Mix for the Dell

Species		Seeds/lb	PLS lbs/ac
Grasses			
bluebunch wheatgrass	Elymus spicatus	140,000	3.0
galleta grass	Hilaria jamesii	159,000	3.0
Indian ricegrass	Oryzopsis hymenoides	141,000	3.0
squirreltail grass	Sitanion hystrix	192,000	2.5
needle and thread	Stipa comata	150,000	3.0
			14.5
Legumes			
yellow sweetclover	Melilotus officinalis	260,000	1.0
hairy vetch	Vicia villosa	20,000	2.0
			3.0
Forbs			
California poppy	Escholzia californica	293,000	1.0
Palmer penstemon	Penstemon palmeri	610,000	0.5
globemallow	Sphaeralcea ambigua	500,000	0.5
			2.0
Shrubs			
black sagebrush	Artemisia nova	907,200	0.2
big sagebrush	Artemisia tridentata	2,500,000	0.1
fourwing saltbush	Atriplex canescens	52,000	4.0
shadscale	Atriplex confertifolia	64,900	4.0
green rabbitbrush	Chrysothamnus viscidiflorus	782,000	0.3
			8.6
		Total	28.1

3.10 Reclamation Schedule

The regrading operations would take place as sites are phased out of the operation. The revegetation of regraded and topsoiled sites would take place in the late fall to insure the seed would be able to overwinter prior to germination. Interim reclamation would take place as outlined in Table 3.10-1.

Table 3.10-1 Reclamation Schedule

Site		Area Reclaimed (Acres)	Reclamation Date
Hogsback Project		21.5	Year 1
Claybank Project		6.9	Year 3
Horn Project		80.1	Year 9
	Total	108.5	

3.11 Monitoring

Each reclaimed site would be monitored on the following schedule to check on progress of the seeding, soil stability and drainage control:

1st Year after Reclamation:

March - June	Biweekly
July - October	Monthly

2nd Year after Reclamation:

March - June	Monthly
July - October	Bimonthly

3rd Year after Reclamation:

April - September	Bimonthly

October - reclamation release (assuming 70% pre-mining vegetative cover re-established)

3.12 Surety

Methodology

All equipment costs include operator and supervision. Earthwork production rates were calculated using the Caterpillar Performance Handbook (Edition 21); unit costs are based on recent contractor quotes (1992) wage scale for the Delta, Utah area.

Regrading

Equipment:	Cat D9N-U @ $173/hr
Average Production:	800 CY/hr (50 min/hr & 100' dozing distance)
Average Cost:	$0.21/CY

Roads: 600 ft @ 15 CY/ft =	9,000 CY	
Ditches: 17,960 ft @ 4.5 ft^2/ft =	2,950 CY	
	11,950 CY x $0.21/CY =	**Total $2,500**

Ripping

Equipment:	Cat D9N-U Ripper @ $173/hr (50 min/hr)
Average Production:	800 CY/hr (50 min/hr)
Average Cost:	$0.18/CY

Production has been broken into categories:

Roads	- to be ripped 2' deep = 0.3 acre/hr
Stockpile areas	- to be ripped 1' deep = 0.6 acre/hr
Pit bottom	- to be ripped 1' deep = 0.6 acre/hr

Ripping costs from Table 3.12-1: **Total $10,000**

Culvert Removal

7 - 36" x 50' Culvert @ $300 each **Total $2,100**

Topsoiling

Scrapers would be used to haul and place topsoil wherever possible. Dozers would be used to spread the topsoil on tops and side-slopes of reclamation areas. After the topsoil is placed it would be ripped, where possible, to a depth of 6 inches with rippers. The dozing and ripping of the topsoil would be accomplished simultaneously by the D9N dozer.

Equipment:	4,500 gal water truck	$60/hr
	D9N dozer (800 CY/hr or pushing scraper)	$173/hr
	Cat 631E Scraper (21 CY struck capacity)	$177/hr each

Topsoil placement costs (from Table 3.12-2) **Total $130,200**

Table 3.12-1 Ripping Costs

Equipment:	Cat D9N-U	Job Efficiency:	0.83
Production:	800 BCY/hr		
Equipment Cost:	$173.00/hr		

Site Description	Acres	Production (acres/hr)	Time (hours)	Equip. Cost ($/hr)	Total Cost ($)
Hogsback Project:					
Haul Roads	0.5	0.3	1.5	$173	$265
Stockpile Area	4.2	0.6	7.0	$173	$1,211
Pit Bottom	2.4	0.6	4.0	$173	$692
Subtotal -->	7.1	0.5	12.5	$173	$2,168
Claybank Project:					
Haul Roads	0.5	0.3	1.5	$173	$265
Stockpile Area	4.0	0.6	6.7	$173	$1,153
Subtotal -->	4.5	0.4	8.2	$173	$1,419
Horn Project:					
Haul Roads	2.2	0.3	7.3	$173	$1,269
Offices, Shops, & Parking Areas	6.1	0.3	20.3	$173	$3,518
Stockpile Area	5.7	0.6	9.5	$173	$1,644
Subtotal -->	14.0	0.4	37.2	$173	$6,430
Total -->	25.5		57.9		$10,017

Table 3.12-2 Topsoil Placement Costs

Equipment:	Cat 631E Scraper (21 CY struck capacity)	Job Efficiency:	0.83
Production:	Varies with Haul Distance		
Equipment Cost:	$177.00/hr (each)	Material:	Topsoil
Equipment:	Cat D9N Dozer (scraper pushing & topsoil spreading)		
Production:	800 CY/hr (or) Pushing Scraper		
Equipment Cost:	$173.00/hr		
Equipment:	4,500 Gal Water Truck		
Equipment Cost:	$60.00/hr		

Site Description	Acres	Depth (inches)	Quantity (CY)	Haul Dist. (ft)	Equipment (type)	Production (CY/hr)	Time (hours)	Equip. Cost ($/hr)	Total Cost ($)
Hogsback Project:									
Haul Roads	0.5	12	807	2,000	Scraper	168	4.8	$177	$850
					Dozer		1.7	$173	$293
North Dump	4.9	12	7,905	2,000	Scraper	168	47.1	$177	$8,329
					Dozer		16.6	$173	$2,872
South Dump	2.4	12	3,872	1,000	Scraper	252	15.4	$177	$2,720
					Dozer		7.9	$173	$1,369
Pit Bottom	2.4	12	3,872	1,000	Scraper	252	15.4	$177	$2,720
					Dozer		7.9	$173	$1,369
Ore Stockpile	4.2	12	6,776	500	Scraper	378	17.9	$177	$3,173
					Dozer		14.4	$173	$2,499
Hogsback Project					Water Truck-		24.3 *	$60	$1,457
Subtotal ---->	14.4		23,232						$26,507
Claybank Project:									
Haul Road	0.5	12	807	1,000	Scraper	252	3.2	$177	$567
					Dozer		1.6	$173	$285
Waste Dump	0.9	12	1,452	1,000	Scraper	252	5.8	$177	$1,020
					Dozer		3.0	$173	$513
Ore Stockpile	4.0	12	6,453	500	Scraper	378	17.1	$177	$3,022
					Dozer		13.8	$173	$2,380
Claybank Project					Water Truck		9.2 *	$60	$551
Subtotal ---->	5.4		8,712						$7,486
Horn Project:									
Haul Roads	2.2	12	3,549	2,000	Scraper	168	21.1	$177	$3,739
					Dozer		7.5	$173	$1,290
North Dump	18.5	12	29,847	2,000	Scraper	168	177.7	$177	$31,446
					Dozer		72.8	$173	$12,601
South Dump	5.2	12	8,389	1,000	Scraper	252	33.3	$177	$5,893
					Dozer		17.1	$173	$2,966
Ore Stockpile	5.7	12	9,196	500	Scraper	378	24.3	$177	$4,306
					Dozer		19.6	$173	$3,392
Office, Shops, & Parking	6.1	12	9,841	1,000	Scraper	252	39.1	$177	$6,912
					Dozer		25.3	$173	$4,380
Areas Adjacent to Pit	7.6	12	12,261	1,000	Scraper	252	48.7	$177	$8,612
					Dozer		31.5	$173	$5,457
Horn Project					Water Truck		87.0 *	$60	$5,217
Subtotal ---->	45.3		73,084						$96,212
Total ---->	65.1		105,028						$130,205

* 1/2 the sum of total dozer hours

Revegetation

Drill & Hand Broadcast Seeding:

- Rangeland Drill
- Diesel Powered Mulcher
- Cat D4 Tractor
- Fertilizer Spreader

Site	Application Cost	Materials Cost	Acres *	Total
Hogsback Project	$430/acre	$611/acre	21.5	$22,400
Claybank Project	$430/acre	$611/acre	6.9	$7,200
Horn Project	$440/acre	$611/acre	80.1	$83,400

* Acreages include adjustment for slopes vs. plan view increase.

Total $113,000

Pit Highwall Safety Berms

Berms:

4 ft high, 2 ft wide at top, 1:1 side slopes: $0.21/linear ft

Hogsback Project:	700 ft @ $0.21/ft	$150
Claybank Project:	500 ft @ $0.21/ft	$100
Horn Project:	4,250 ft @ $0.21/ft	$900

Total $1,200

Miscellaneous

Mobilization/Demobilization:

- 10 pieces of equipment @ $1,000 ea **$10,000**

Construction Supervision

Assume supervision:

Hogsback Project:	6 weeks
Claybank Project:	3 weeks
Horn Project:	25 weeks

34 weeks x 40 hours/week x $20.00/hr **Total $27,200**

Summary

The estimated cost is $350,100 to reclaim the total acreage disturbed through life of the Topaz Beryllium Project. This estimate covers the reclamation of approximately 108 acres. All but approximately 20 acres of the total project disturbance would be reclaimed. Table 3.12-3 provides a summary of the reclamation costs.

Table 3.12-3 **Reclamation Cost Summary**

Regrading:	$2,500
Ripping:	$10,000
Culvert Removal:	$2,100
Topsoiling:	$130,200
Revegetation:	$113,000
Pit Highwall Safety Berms:	$1,200
Miscellaneous:	$10,000
Construction Supervision:	$27,200
Subtotal for all Activities:	$296,200
10 percent Contingency:	$29,600
Subtotal (in 1992 Dollars):	$325,800
Subtotal (in 1997 Dollars) (escalation @ 1.45 percent/year for five years):	$350,100
Proposed Bond Amount:	**$350,100**

Chapter 4 References

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SCS, 1972, National Engineering Handbook NEH-4 Hydrology: US Soil Conservation Service, Washington D.C.